

## Electron Configuration Worksheet (and Lots More!!)

### Brief Instructions

An electron configuration is a method of indicating the arrangement of electrons about a nucleus. A typical electron configuration consists of numbers, letters, and superscripts with the following format:

1. A number indicates the energy level (The number is called the principal quantum number.).
2. A letter indicates the type of orbital; s, p, d, f.
3. A superscript indicates the number of electrons in the orbital. Example:  $1s^2$  means that there are two electrons in the 's' orbital of the first energy level. The element is helium.

To write an electron configuration:

1. Determine the total number of electrons to be represented.
2. Use the Aufbau process to fill the orbitals with electrons. The Aufbau process requires that electrons fill the lowest energy orbitals first. In another words, atoms are built from the ground upwards.
3. The sum of the superscripts should equal the total number of electrons.

Example:  ${}_{12}\text{Mg } 1s^2 2s^2 2p^6 3s^2$

### Configuration Writing Practice

Write a ground state electron configuration for each neutral atom. Ground state means that all of the lowest possible energy levels (up to the proper number of electrons for the element) are filled.

1. Na
2. Pb
3. Sr
4. U
5. N
6. Ag
7. Ti
8. Ce
9. Cl
10. Hg

Write a ground state electron configuration for these ions. Remember that ions have a change in the total number of electrons (positive have lost electrons and negative have gained).

Example:  $\text{N}^{3-}$  is  $1s^2 2s^2 2p^6$ . It has three extra electrons.

11.  $\text{O}^{2-}$
12.  $\text{Fe}^{2+}$
13.  $\text{B}^{3+}$
14.  $\text{Ni}^{2+}$
15.  $\text{K}^+$
16.  $\text{Co}^{3+}$

An excited atom has an electron or electrons which are not in the lowest energy state. Excited atoms are unstable energetically. The electrons eventually fall to a lower level. \* is used to indicate an excited atom. For example:  $^*\text{Li } 1s^2 3p^1$ . (The ground state for Li is  $1s^2 2s^1$ .)

Write an excited state electron configuration for each. 17. Al 18. Ar 19. K 20. C

21. If each orbital can hold a maximum of two electrons, how many electrons can each of the following hold? a. 2s b. 5p c. 4f d. 3d e. 4d
22. What is the shape of an s orbital?
23. How many s orbitals can there be in an energy level?
24. How many electrons can occupy an s orbital?
25. What is the shape of a p orbital?
26. How many p orbitals can there be in an energy level?
27. Which is the lowest energy level that can have a s orbital?
28. Which is the lowest energy level that can have a p orbital?
29. Is it possible for two electrons in the same atom to have exactly the same set of quantum numbers?
30. Distinguish between an atom in its ground state and an excited atom.
31. How many d orbitals can there be in an energy level?
32. How many d electrons can there be in an energy level?
33. Which is the lowest energy level having d orbitals?
34. How many f electrons can there be in an energy level?
35. Which is the lowest energy level having f orbitals?